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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/038,133	01/02/2002	Neil Benjamin	7103/235(P0742)	7415

27879 7590 07/19/2004

INDIANAPOLIS OFFICE 27879
BRINKS HOFER GILSON & LIONE
ONE INDIANA SQUARE, SUITE 1600
INDIANAPOLIS, IN 46204-2033

EXAMINER	
MILORD, MARCEAU	
ART UNIT	**PAPER NUMBER**
2682	5

DATE MAILED: 07/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	**Application No.** 10/038,133	**Applicant(s)** NEIL BENJAMIN
	Examiner Marceau Milord	**Art Unit** 2682

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 January 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-53* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson et al (US Patent No 6535785 B2) in view of Collins (US Patent No 6589437 B1).

Regarding claim 1, Johnson et al discloses an RF generating system (figs. 1-2) for supplying RF output power (col. 4, lines 8-56), the RF generating system comprising: an RF power node; a main power source electrically coupled with the RF power node, the main power source operable to supply power utilized in generation of RF output power (col. 5, lines 6-48; col. 8, lines 18-49).

However, Johnson et al does not specifically disclose an auxiliary power source electrically coupled with the RF power node, the auxiliary power source operable to supplement the power supplied by the main power source.

On the other hand, Collins, from the same field of endeavor, discloses a method and an apparatus for actively controlling the density of the species generated in a plasma reactor using time-modulation (col. 6, line 46-col. 7, line 9). Furthermore, an antenna overlies the ceiling 250 and is coupled to a power source where the power source is an RF power generator. A signal modulator is connected to control the power source and provide the means necessary to pulse the energy emission from the antenna. In addition, the signal modulator may also be connected to a RF bias power supply for pulsing the electric field of the RF bias power supply. This signal modulator may be used together or separately when pulsing the plasma, so that the electric field of the RF bias power supply and the energy emission of the RF power supply may be used separately or simultaneously (figs. 11-13;col. 16, lines 25-49;col. 17, lines 31-64; col. 21, line 50- col. 22, line 28). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the technique of Collins to the system of Johnson in order to provide a means for modulation.

Regarding claim 2, Johnson et al as modified discloses an RF generating system (figs. 1-2) for supplying RF output power (col. 4, lines 8-56), comprising an RF output stage electrically coupled with the main power source, the auxiliary power source and the RF power node, wherein the RF output stage is operable to generate RF output power on the RF power node as function of the power supplied by the main power source and the auxiliary power source (col. 11, line 43- col. 12, line 6;col. 13, line 36- col. 14, line 17).

Regarding claim 3, Johnson et al as modified discloses an RF generating system (figs. 1-2) for supplying RF output power (col. 4, lines 8-56), wherein the main power source comprises

a switch-mode DC power supply and the auxiliary power source comprises a linear DC power supply (col. 8, lines 18-49; col. 11, lines 43- 63).

Regarding claim 4, Johnson et al as modified discloses an RF generating system (figs. 1-2) for supplying RF output power (col. 4, lines 8-56), wherein the power supplied by the main and auxiliary power sources comprises DC power (col. 11, line 43-col. 12,line 6).

Regarding claim 5, Johnson et al as modified discloses an RF generating system (figs. 1-2) for supplying RF output power (col. 4, lines 8-56), comprising a combiner electrically coupled with the main power source, the auxiliary power source and the RF power node, wherein the combiner is operable to generate the RF output power on the RF power node as function of power supplied by the main power source and the auxiliary power source (col. 11, lines 43- 63).

Regarding claim 6, Johnson et al as modified discloses an RF generating system (figs. 1-2) for supplying RF output power (col. 4, lines 8-56), wherein the main power source is a main RF output stage comprising a switch-mode power supply, and the auxiliary power source is an auxiliary RF output stage comprising an amplitude agile power amplifier (col. 13, line 36- col. 14, line 37).

Regarding claim 7, Johnson et al as modified discloses an RF generating system (figs. 1-2) for supplying RF output power (col. 4, lines 8-56), wherein the power supplied by the main and auxiliary power sources comprise RF power (col. 11, lines 43- 63).

Regarding claim 8, Johnson et al as modified discloses an RF generating system (figs. 1-2) for supplying RF output power (col. 4, lines 8-56), wherein the main power source supplies power as a function of an operating point of the RF generating system and the auxiliary power source supplies power as a function of a feedback signal (col. 10, line 47- col. 11, line 63).

Regarding claim 9, Johnson et al as modified discloses an RF generating system (figs. 1-2) for supplying RF output power (col. 4, lines 8-56), comprising an impedance matching network and a plasma processing chamber, the impedance matching network and the plasma processing chamber electrically coupled with the RF power node (col. 11, line 39- col. 12, line 24).

Regarding claims 10-11, 18-22, Johnson et al discloses an RF generating system for supplying RF output power (figs. 1-2;col. 4, lines 8-56), the RF generating system comprising: an RF output stage; a first power supply electrically coupled with the RF output stage, the first power supply operable to supply DC power to the RF output stage (col. 5, lines 6-48; col. 8, lines 18-49).

However, Johnson et al does not specifically disclose a second power supply electrically coupled with the first power supply and the RF output stage, the DC power selectively adjustable by the second power supply.

On the other hand, Collins, from the same field of endeavor, discloses a method and an apparatus for actively controlling the density of the species generated in a plasma reactor using time-modulation (col. 6, line 46-col. 7, line 9). Furthermore, an antenna overlies the ceiling 250 and is coupled to a power source where the power source is an RF power generator. A signal modulator is connected to control the power source and provide the means necessary to pulse the energy emission from the antenna. In addition, the signal modulator may also be connected to a RF bias power supply for pulsing the electric field of the RF bias power supply. This signal modulator may be used together or separately when pulsing the plasma, so that the electric field of the RF bias power supply and the energy emission of the RF power supply may be used

separately or simultaneously (figs. 11-13;col. 16, lines 25-49;col. 17, lines 31-64; col. 21, line 50- col. 22, line 28). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the technique of Collins to the system of Johnson in order to provide a means for modulation.

Regarding claim 12, Johnson et al as modified discloses an RF generating system for supplying RF output power (figs. 1-2;col. 4, lines 8-56), wherein the first power supply is operable to modulate the DC power at frequencies in a range that is at least an order of magnitude less than the frequency of the RF power (col. 15, lines 9-54).

Claim 13 is similar in scope to claims 10-11, and therefore is rejected under a similar rationale.

Regarding claim 14, Johnson et al as modified discloses an RF generating system for supplying RF output power (figs. 1-2;col. 4, lines 8-56), wherein the first power supply is operable to supply a magnitude of DC power to the RF output stage to create a desired amplitude of RF output power (col. 8, lines 18-49; col. 11, lines 43- 63).

Regarding claim 15, Johnson et al as modified discloses an RF generating system for supplying RF output power (figs. 1-2;col. 4, lines 8-56), wherein the second power supply is operable to supply a magnitude of DC power that is at least an order of magnitude less than DC power supplied by the first DC power supply (col. 8, lines 18-49; col. 11, lines 43- 63).

Regarding claim 16, Johnson et al as modified discloses an RF generating system for supplying RF output power (figs. 1-2;col. 4, lines 8-56), wherein the first power supply is operable to modulate the DC power as a function of an RF set-point (col. 8, lines 18-49; col. 11, lines 43- 63).

Regarding claim 17, Johnson et al as modified discloses an RF generating system for supplying RF output power (figs. 1-2;col. 4, lines 8-56), wherein the second power supply is operable to adjust the DC power as a function of a feedback signal, the feedback signal indicative of stability (col. 11, lines 25- col. 12, line 60).

Regarding claims 23-27, Johnson et al discloses an RF generating system (figs. 1-2) for processing plasma (col. 4, lines 8-56), the RF generating system comprising: an RF output stage operable to generate RF output power; a DC rail electrically coupled with the RF output stage (col. 5, lines 6-48; col. 8, lines 18-49); a switch-mode DC power supply electrically coupled with the DC rail, the switch-mode DC power supply operable as a main power supply to modulate the magnitude of DC power on the DC rail as a function of an RF set-point; and a linear DC power supply electrically coupled with the DC rail (col. 11, line 39- col. 12, line 24).

However, Johnson et al does not specifically disclose an auxiliary power supply to buck and boost the DC power on the DC rail as a function of a feedback signal; wherein the feedback signal is indicative of instabilities related to the plasma; wherein the feedback signal is indicative of instabilities related to the plasma.

On the other hand, Collins, from the same field of endeavor, discloses a method and an apparatus for actively controlling the density of the species generated in a plasma reactor using time-modulation (col. 6, line 46-col. 7, line 9). Furthermore, an antenna overlies the ceiling 250 and is coupled to a power source where the power source is an RF power generator. A signal modulator is connected to control the power source and provide the means necessary to pulse the energy emission from the antenna. In addition, the signal modulator may also be connected to a RF bias power supply for pulsing the electric field of the RF bias power supply. This signal

modulator may be used together or separately when pulsing the plasma, so that the electric field of the RF bias power supply and the energy emission of the RF power supply may be used separately or simultaneously (figs. 11-13;col. 16, lines 25-49;col. 17, lines 31-64; col. 21, line 50- col. 22, line 28). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the technique of Collins to the system of Johnson in order to provide a means for modulation.

Regarding claim 28, Johnson et al as modified discloses an RF generating system (figs. 1-2) for processing plasma (col. 4, lines 8-56), wherein the switch-mode DC power supply is operable to modulate the amplitude of the RF output power at a frequency less than or equal to about 2 MHz (col. 8, lines 18-49; col. 11, lines 43- 63).

Regarding claim 29, Johnson et al as modified discloses an RF generating system (figs. 1-2) for processing plasma (col. 4, lines 8-56), wherein the linear DC power supply is operable to modulate the amplitude of the RF output power at frequencies beyond the bandwidth of the switch-mode DC power supply up to the frequency of the RF output power (col. 8, lines 18-49; col. 11, lines 43- 63).

Regarding claim 30, Johnson et al as modified discloses an RF generating system (figs. 1-2) for processing plasma (col. 4, lines 8-56), comprising a controller, the controller operable to perform coarse control of the amplitude of the RF output power as a function of the switch-mode DC power supply (col. 8, lines 18-49; col. 11, lines 43- 63).

Regarding claim 31, Johnson et al as modified discloses an RF generating system (figs. 1-2) for processing plasma (col. 4, lines 8-56), comprising a controller, the controller operable to

perform fine control of the amplitude of the RF output power as a function of the linear DC power supply (col. 8, lines 18-49; col. 11, lines 43- 63).

Regarding claim 32, Johnson et al as modified discloses an RF generating system (figs. 1-2) for processing plasma (col. 4, lines 8-56), comprising a sensor, the sensor operable to provide the feedback signal, wherein the feedback signal is indicative of instabilities related to a load supplied by the RF output power (col. 11, lines 25- col. 12, line 60).

Regarding claims 33-36, Johnson et al discloses an RF generating system for generating RF output power to process plasma (figs. 1-2;col. 4, lines 8-56), the RF generating system comprising: a first RF output stage; a second RF output stage in operable cooperation with the first RF output stage (col. 5, lines 6-48; col. 8, lines 18-49); and a combiner electrically coupled with the first RF output stage and the second RF output stage, the combiner operable to combine RF power supplied by the first RF output stage (col. 11, lines 25- col. 12, line 60).

However, Johnson et al does not specifically disclose the second RF output stage to generate RF output power; wherein the second RF output stage comprises one of a linear power amplifier and a quasi-linear power amplifier.

On the other hand, Collins, from the same field of endeavor, discloses a method and an apparatus for actively controlling the density of the species generated in a plasma reactor using time-modulation (col. 6, line 46-col. 7, line 9). Furthermore, an antenna overlies the ceiling 250 and is coupled to a power source where the power source is an RF power generator. A signal modulator is connected to control the power source and provide the means necessary to pulse the energy emission from the antenna. In addition, the signal modulator may also be connected to a RF bias power supply for pulsing the electric field of the RF bias power supply. This signal

modulator may be used together or separately when pulsing the plasma, so that the electric field of the RF bias power supply and the energy emission of the RF power supply may be used separately or simultaneously (figs. 11-13;col. 16, lines 25-49;col. 17, lines 31-64; col. 21, line 50- col. 22, line 28). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the technique of Collins to the system of Johnson in order to provide a means for modulation.

Regarding claim 37, Johnson et al as modified discloses an RF generating system for generating RF output power to process plasma (figs. 1-2;col. 4, lines 8-56), wherein the second RF output stage is operable to adjust the RF power provided by the first RF output stage (col. 13, line 36- col. 14, line 17).

Regarding claim 38, Johnson et al as modified discloses an RF generating system for generating RF output power to process plasma (figs. 1-2;col. 4, lines 8-56), wherein the RF power supplied by the second RF output stage is added and subtracted from RF power supplied by the first RF output stage as a function of phase rotation of the RF power of the second RF output stage relative to the RF power of the first RF output stage (col. 11, line 43- col. 12, line 6;col. 13, line 36- col. 14, line 17).

Regarding claim 39, Johnson et al as modified discloses an RF generating system for generating RF output power to process plasma (figs. 1-2;col. 4, lines 8-56), wherein the frequency response capability of the second RF output stage is at least one order of magnitude larger than the frequency response capability of the first RF output stage (col. 13, line 36- col. 14, line 17).

Regarding claims 40-44, Johnson et al discloses a method of supplying RF output power (figs. 1-2;col. 4, lines 8-56), the method comprising: generating RF output power; coarsely controlling the RF output power as a function of power supplied by a main power source (col. 5, lines 6-48; col. 8, lines 18-49).

However, Johnson et al does not specifically disclose the steps of monitoring a signal from a sensor; controlling the RF output power as a function of power supplied by an auxiliary power source; modulating the amplitude of the RF output power at frequencies at least one order of magnitude less than the frequency of the RF output power.

On the other hand, Collins, from the same field of endeavor, discloses a method and an apparatus for actively controlling the density of the species generated in a plasma reactor using time-modulation (col. 6, line 46-col. 7, line 9). Furthermore, an antenna overlies the ceiling 250 and is coupled to a power source where the power source is an RF power generator. A signal modulator is connected to control the power source and provide the means necessary to pulse the energy emission from the antenna. In addition, the signal modulator may also be connected to a RF bias power supply for pulsing the electric field of the RF bias power supply. This signal modulator may be used together or separately when pulsing the plasma, so that the electric field of the RF bias power supply and the energy emission of the RF power supply may be used separately or simultaneously (figs. 11-13;col. 16, lines 25-49;col. 17, lines 31-64; col. 21, line 50- col. 22, line 28). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the technique of Collins to the system of Johnson in order to provide a means for modulation.

Regarding claim 45, Johnson et al as modified discloses a method of supplying RF output power (figs. 1-2;col. 4, lines 8-56), comprises modulating the RF output power in a meta-stable region surrounding an operating point (col. 11, lines 25- col. 12, line 60).

Regarding claim 46, Johnson et al as modified discloses a method of supplying RF output power (figs. 1-2;col. 4, lines 8-56), comprises supplying power that is DC power to an RF output stage to create a desired amplitude of RF output power (col. 11, lines 25- col. 12, line 60).

Claim 47 contains similar limitations addressed in claims 40 and 23, and therefore is rejected under a similar rationale.

Claims 48-49 contain similar limitations addressed in claims 40 and 33, and therefore are rejected under a similar rationale.

Regarding claims 50-53, Johnson et al discloses a method of supplying RF output power to process plasma (figs. 1-2; col. 4, lines 8-56), the method comprising: generating RF output power with an RF output stage (col. 5, lines 6-48; col. 8, lines 18-49); and controlling the amplitude of the RF output power with DC power supplied to the RF output stage by a first power supply (col. 11, lines 25- col. 12, line 60).

However, Johnson et al does not specifically disclose the features of a second power supply; modulating the DC power with the second power supply at frequencies up to the frequency of the RF output power; comprising controlling the magnitude of DC power supplied by the second power supply as a function of the stability of a load coupled with the RF output stage; and modulating the DC power with the second power supply at frequencies up to the frequency of the RF output power.

On the other hand, Collins, from the same field of endeavor, discloses a method and an apparatus for actively controlling the density of the species generated in a plasma reactor using time-modulation (col. 6, line 46-col. 7, line 9). Furthermore, an antenna overlies the ceiling 250 and is coupled to a power source where the power source is an RF power generator. A signal modulator is connected to control the power source and provide the means necessary to pulse the energy emission from the antenna. In addition, the signal modulator may also be connected to a RF bias power supply for pulsing the electric field of the RF bias power supply. This signal modulator may be used together or separately when pulsing the plasma, so that the electric field of the RF bias power supply and the energy emission of the RF power supply may be used separately or simultaneously (figs. 11-13;col. 16, lines 25-49;col. 17, lines 31-64; col. 21, line 50- col. 22, line 28). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the technique of Collins to the system of Johnson in order to provide a means for modulation.

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Johnson et al US Patent No 6313584 B1 discloses a system and method for processing substrates having an improved matching system.

Collins et al US Patent No 6440866 B1 discloses a method of providing a polymer-hardening precursor piece within the reactor chamber during an etch process with a fluoro-carbon.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marceau Milord whose telephone number is 703-306-3023. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian C. Chin can be reached on 703-308-6739. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Examiner

Art Unit 2682